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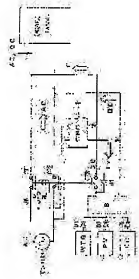
(54) DISTRIBUTED POWER SUPPLY SYSTEM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a new distributed power supply system capable of supplying stable electric power to loads through electronic transformers commonly utilized with a duty cycle of nearly 100 %, combined with power of natural energy system and midnight power having large variable factors or the stable power of fuel cells, etc., of increasing price and performance ratio of the whole system, and thus of promoting the widespread use of distributed power supply and achieving energy-savings.
SOLUTION: The system performs a distributed power supply to combined AC/DC loads Lac/dc using a wind turbine generator WTG, a photovoltaic power generator PV, a fuel cell FC and a battery B and a commercial AC power source utility. The wind turbine generator WTG, the photovoltaic power generator PV, and the fuel cell FC serve as a DC power source in which each rated power and voltage are unified to the rated voltage of the battery B, and are designed to supply AC power from the commercial AC power source utility to the combined AC/DC loads Lac/dc until the battery B reaches a full charge by the DC power source, to supply DC power from the battery B to the combined AC/DC loads Lac/dc when the battery B is fully charged, and to supply AC power from the commercial AC power source utility to the combined AC/DC loads Lac/dc when the battery B is approaching to the final stage of discharge.



* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]
It is a distributed feed system which performs distributed electric supply to an intersection and load both for a direct current using at least 1 of a wind power generator, a photovoltaic power generation apparatus, and fuel cells, a storage battery, and commercial alternating current power,

A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery,
Alternating current power from commercial alternating current power is supplied to an intersection and load both for a direct current until a storage battery reaches a full charge by the source of direct current power concerned,
At the time of a full charge of a storage battery, direct current power from the storage battery concerned is supplied to an intersection and load both for a direct current,
A distributed feed system supplying alternating current power from commercial alternating current power to an intersection and load both for a direct current if a telophase of discharge of a storage battery is approached.
[Claim 2]
It is a distributed feed system which performs distributed electric supply to an intersection and load both for a direct current using at least 1 of a wind power generator, a photovoltaic power generation apparatus, and fuel cells, a storage battery, and commercial alternating current power without going via a 2 winding electronic transformer,
A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery,
A 2 winding electronic transformer has two bidirectional input/output terminals with an intersection and direct-current two ways,
One bidirectional input/output terminal of the 2 winding electronic transformer concerned was connected to an output side of a source of direct current power, and a bidirectional input/output terminal of another side has connected between commercial alternating current power, and intersections and loads both for a direct current to T shape,
Alternating current power from commercial alternating current power is supplied to an intersection and load both for a direct current without going via a 2 winding electronic transformer, until a storage battery reaches a full charge by a source of direct current power,
At the time of a full charge of a storage battery, or interruption to service of commercial alternating current power, a source of direct current power and direct current power from a storage battery are supplied to an intersection and load both for a direct current via a 2 winding electronic transformer,
At the time of discharge advance of a storage battery, electric power supply is performed from a fuel cell,
A distributed feed system charging a storage battery with bidirection, and an intersection and a

conversion-into-dc function which a 2 winding electronic transformer has while supplying alternating current power from commercial alternating current power to - midnight power feed time belt to an intersection and load both for a direct current at night.
[Claim 3]
It is a distributed feed system which performs distributed electric supply to an intersection and load both for a direct current via a 3 winding electronic transformer using at least 1 of a wind power generator, a photovoltaic power generation apparatus, and fuel cells, a storage battery, and commercial alternating current power,
A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery,
A 3 winding electronic transformer has three bidirectional input/output terminals with an intersection and direct-current two ways,
A source of direct current power and a storage battery and commercial alternating current power, and an intersection and load both for a direct current are mutually insulated and connected by the 3 winding electronic transformer concerned,
Alternating current power from commercial alternating current power is supplied to an intersection and load both for a direct current via a 3 winding electronic transformer until a storage battery reaches a full charge by a source of direct current power,
At the time of a full charge of a storage battery, or interruption to service of commercial alternating current power, a source of direct current power and direct current power from a storage battery are supplied to an intersection and load both for a direct current via a 3 winding electronic transformer,
At the time of discharge advance of a storage battery, electric power supply is performed from a fuel cell,
A distributed feed system charging a storage battery with bidirection, and an intersection and a conversion-into-dc function which a 3 winding electronic transformer has while supplying alternating current power from commercial alternating current power to - midnight power feed time belt to an intersection and load both for a direct current at night.
[Claim 4]
It is a distributed feed system which performs distributed electric supply to load only for exchange using at least 1 of a wind power generator, a photovoltaic power generation apparatus, and fuel cells, a storage battery, and commercial alternating current power without going via a bidirectional DC-DC converter and a 2 winding electronic transformer,
A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery,
It has the strange recovery solid state switch which a 2 winding electronic transformer has two bidirectional input/output terminals with an intersection and direct-current two ways, and was provided in a high frequency transformer side, its storage battery side, and a load side,
One bidirectional input/output terminal of the 2 winding electronic transformer concerned was connected to an output side of a source of direct current power, and a bidirectional input/output terminal of another side has connected between commercial alternating current power and loads only for exchange to T shape,
Alternating current power from commercial alternating current power is supplied to load only for exchange without going via a bidirectional DC-DC converter and a 2 winding electronic transformer, until a storage battery reaches a full charge by a source of direct current power,
At the time of a full charge of a storage battery, or interruption to service of commercial alternating current power. After changing a source of direct current power, and direct current power from a storage battery into a single-phase-full-waves rectification waveform by the half cycle sine wave abnormal conditions of a bidirectional DC-DC converter, A high-frequency-modulation phase of two pieces or two pairs of one-way solid state switches which constitutes a strange recovery solid state switch provided in the storage battery side of a high frequency transformer of a 2 winding electronic transformer is reversed by turns for every half cycle of

commercial frequency, It gets over by a strange recovery solid state switch provided in a load side of a high frequency transformer of a 2 winding electronic transformer, a sinusoidal wave alternative current output is taken out, and load only for exchange is supplied,
At the time of discharge advance of a storage battery, electric power supply is performed from a fuel cell,
While supplying alternating current power from commercial alternating current power to - midnight power feed time belt to load only for exchange at night, bidirection which a 2 winding electronic transformer has, an intersection and a conversion-into-dc function, and rate rectifying operation of pressure-up type high tensile at the time of charge of a bidirectional DC-DC converter are used together, and a storage battery is charged,
A distributed feed system changing direct current power into exchange, carrying out phase simulation to the commercial-alternating-current-power side automatically, and carrying out a head-tide style with the energy bidirectional transmission characteristic of a 2 winding electronic transformer when a storage battery is close to a full charge and commercial alternating current power is not interruption to service in the time of a light load.
[Claim 5]
It is a distributed feed system which performs distributed electric supply to load only for exchange via a bidirectional DC-DC converter and a 3 winding electronic transformer using at least 1 of a wind power generator, a photovoltaic power generation apparatus, and fuel cells, a storage battery, and commercial alternating current power,
A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery,
It has the strange recovery solid state switch which a 3 winding electronic transformer has three bidirectional input/output terminals with an intersection and direct-current two ways, and was provided in its high frequency transformer and commercial-alternating-current-power side, the storage battery side, and a load side,
A source of direct current power and a storage battery and commercial alternating current power, and load only for exchange are mutually insulated and connected by the 3 winding electronic transformer concerned,
Alternating current power from commercial alternating current power is supplied to load only for exchange via a 3 winding electronic transformer until a storage battery reaches a full charge by a source of direct current power,
At the time of a full charge of a storage battery, or interruption to service of commercial alternating current power. After changing a source of direct current power, and direct current power from a storage battery into a single-phase-full-waves rectification waveform by the half cycle sine wave abnormal conditions of a bidirectional DC-DC converter, A high-frequency-modulation phase of two pieces or two pairs of one-way solid state switches which constitutes a strange recovery solid state switch provided in the storage battery side of a high frequency transformer of a 3 winding electronic transformer is reversed by turns for every half cycle of commercial frequency, It gets over by a strange recovery solid state switch provided in a load side of a high frequency transformer of a 3 winding electronic transformer, a sinusoidal wave alternative current output is taken out, and load only for exchange is supplied,
At the time of discharge advance of a storage battery, electric power supply is performed from a fuel cell,
While supplying alternating current power from commercial alternating current power to - midnight power feed time belt to load only for exchange at night, bidirection which a 3 winding electronic transformer has, an intersection and a conversion-into-dc function, and rate rectifying operation of pressure-up type high tensile at the time of charge of a bidirectional DC-DC converter are used together, and a storage battery is charged,
A distributed feed system changing direct current power into exchange using the energy bidirectional transmission characteristic of a 3 winding electronic transformer, carrying out phase simulation to the commercial-alternating-current-power side automatically, and carrying out a head-tide style when a storage battery is close to a full charge and commercial alternating

current power is not interruption to service in the time of a light load.
[Claim 6]
The distributed feed system according to any one of claims 1 to 5, wherein storage of compressed water matter for fuel cells is possible.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
The invention of this application relates to a distributed feed system. The invention of this application is useful in more detail to the distributed electric supply which combined the accumulation-of-electricity energy of - midnight power in natural power sources, a fuel cell, and the night, It is related with the new distributed feed system which can interconnection-supply electric power to load efficiently by the diode and an OR circuit especially by using two or more intersection and direct-current energy sources as an electronic transformer.
[Background of the Invention]
[0002]
Photovoltaics is spreading as an example of representation of clean energy. A part of wind power generation is also introduced regionally. These natural power sources have many hours-worked ratios of daylight hours or a windmill, and examples used as an auxiliary energy source while generating electric power is always changed further, adequate supply of electric power is difficult and the actual condition is mainly concerned with commercial power because of change of the weather or a weather condition.
[0003]
However, a power supply means with the efficiency sufficient [the power supply system in the 21st century which controls global warming] by the distribution electric supply which examination is advanced on a global scale and stuck to the consumer place region in addition to intensive power generation, such as atomic power, fire power, and hydraulic power, is being examined variously.
[0004]
Also in the conventional above-mentioned intensive power generation, in order to equalize a large change of the amount of used electricity during day and night and to aim at efficient employment of dispatch ******, even if the system of using - midnight power effectively at night is introduced, it is.
[0005]
On the other hand, by the power electronics field, with the conventional copper-iron mold transformer, the electronic transformer the intersection and both for a direct current is developed, and power conversion is possible regardless of exchange and direct current of an energy source. [which was not realized] Therefore, with an electronic transformer, they are connected by alternating current power like commercial power or wind power generation, and direct current power like sunlight, a fuel cell, and the cell for midnight power storage, and by opening and closing of each energy source. Alternating current power and direct current power become available as an uninterruptible power source which permits the hits within a half cycle in each home, administration building, etc.
[Description of the Invention]
[Problem(s) to be Solved by the Invention]
[0006]

As a model in which an intersection and direct-current two ways are possible, certainly now with the electrical household appliances and electrical equipment which have spread at home An electric bulb, There are an inverter type fluorescent lamp, a power tool, etc., and if an air-conditioner, a refrigerator, a microwave oven, a cleaner, a personal computer, FAX, etc. are inverter types except for the model in which the voltage doubler rectifier circuit and the exchange protection circuit were included in part, it is usable in principle in them. On the other hand, the actual condition is that neither the dimmer control of a thyristor-phase-control method, nor a heater and a rice cooker can be used by direct current. Therefore, the apparatus only for exchange and the electrical household appliances and electrical equipment an intersection and both for a direct current have inconvenient [which must divide and use an interior wiring system (electric socket)] for the time being.

[0007]

However, since a conventional system always transforms direct-current power generation energy inversely to a commercial alternating current through an inverter, and changes it into a direct current again within actual load, it changes into a high frequency inverter or variable frequency alternating current power further and an electric motor and a compressor are driven, there is much conversion loss.

[0008]

In the low-pressure power distribution system, drawing 1 is the figure which classified the propriety of the conformity of the intersection and direct-current electric supply of the conventional electrical household appliances and electrical equipment in the case of using an intersection and a direct-current energy source for a distributed feed system, and shows the relation between them and conversion efficiency. For example, the efficiency in the case of making a fluorescent lamp turn on from photovoltaics is eta_1, eta_2, and eta_3, and when operating a personal computer and FAX, it serves as eta_1, eta_2, eta_3, and eta_4.

[0009]

Drawing 2 shows the conventional example of the photovoltaics in the case of supplying an intersection and a direct-current energy source to load directly, and wind power generation in a low-pressure power distribution system. Since sunlight supplies electric power directly to both commercial alternating current power and load via a system cooperation inverter (common name: power conditioner) conventionally and the time jitter of wind power generation of generating electric power is intense, as illustrated to this drawing 2, It is constituted as a respectively separate system as system cooperation is performed via a bi directional converter with ** and a discharge function, after storing in a storage battery. Although active power generating time in the daytime is 6 to 8 hours also at the time of fine weather and the week or month-long generating duration ratio of wind power generation changes a lot by the season or the area on the other hand about sunlight, it is concluded that the average generating duration ratio of our country is lower than the generating duration ratio of sunlight. This is also a cause which spread is not following compared with the West.

[0010]

Thus, if control machinery, such as an inverter, was formed for every electric power of the source of energy generation with a low operation ratio, the cost of the whole system goes up and it becomes a cause which checks spread.

[0011]

Then, the invention of this application combines the large natural-power-sources system electric power of these change factor, and stable electric power, such as midnight power and a fuel cell, in view of the situation as above, It is making into the technical problem to provide the new distributed feed system which can supply stable electric power to load via the electronic transformer used in common with the usage rate near about 100%, can raise the rate of cost / performance of the whole system, and can attain spreading and promotion and energy saving of distributed electric supply.

[Means for Solving the Problem]

[0012]

An invention of this application as what solves the above-mentioned technical problem to the 1st. At least one of a wind power generator, a photovoltaic power generation apparatus, and fuel cells. It is a distributed feed system which performs distributed electric supply to an intersection and load both for a direct current using a storage battery and commercial alternating current power, A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery, Alternating current power from commercial alternating current power is supplied to an intersection and load both for a direct current until a storage battery reaches a full charge by the source of direct current power concerned, If direct current power from the storage battery concerned is supplied to an intersection and load both for a direct current at the time of a full charge of a storage battery and a telophase of discharge of a storage battery is approached, a distributed feed system supplying alternating current power from commercial alternating current power to an intersection and load both for a direct current is provided.

[0013]

In the 2nd, at least one of a wind power generator, a photovoltaic power generation apparatus, and fuel cells. It is a distributed feed system which performs distributed electric supply to an intersection and load both for a direct current using a storage battery and commercial alternating current power without going via a 2 winding electronic transformer, A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery, A 2 winding electronic transformer has two bidirectional input/output terminals with an intersection and direct-current two ways, One bidirectional input/output terminal of the 2 winding electronic transformer concerned is connected to an output side of a source of direct current power, A bidirectional input/output terminal of another side has connected between commercial alternating current power, and intersections and loads both for a direct current to T shape, Alternating current power from commercial alternating current power is supplied to an intersection and load both for a direct current without going via a 2 winding electronic transformer, until a storage battery reaches a full charge by a source of direct current power, At the time of a full charge of a storage battery, or interruption to service of commercial alternating current power, a source of direct current power and direct current power from a storage battery are supplied to an intersection and load both for a direct current via a 2 winding electronic transformer, While performing electric power supply from a fuel cell at the time of discharge advance of a storage battery and supplying alternating current power from commercial alternating current power to - midnight power feed time belt to an intersection and load both for a direct current at night, A distributed feed system charging a storage battery with bidirection, and an intersection and a conversion-into-dc function which a 2 winding electronic transformer has is provided.

[0014]

In the 3rd, at least one of a wind power generator, a photovoltaic power generation apparatus, and fuel cells. It is a distributed feed system which performs distributed electric supply to an intersection and load both for a direct current via a 3 winding electronic transformer using a storage battery and commercial alternating current power, A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery, A 3 winding electronic transformer has three bidirectional input/output terminals with an intersection and direct-current two ways, A source of direct current power and a storage battery and commercial alternating current power, and an intersection and load both for a direct current are mutually insulated and connected by the 3 winding electronic transformer concerned, Alternating current power from commercial alternating current power is supplied to an intersection and load both for a direct current via a 3 winding electronic transformer until a storage battery reaches a full charge by a source of direct current power, At the time of a full charge of a storage battery, or interruption to service of commercial alternating current power, a source of direct current power and direct current power from a storage battery are supplied to

an intersection and load both for a direct current via a 3 winding electronic transformer, While performing electric power supply from a fuel cell at the time of discharge advance of a storage battery and supplying alternating current power from commercial alternating current power to - midnight power feed time belt to an intersection and load both for a direct current at night, A distributed feed system charging a storage battery with bidirection, and an intersection and a conversion-into-dc function which a 3 winding electronic transformer has is provided.

[0015]

In the 4th, at least one of a wind power generator, a photovoltaic power generation apparatus, and fuel cells. It is a distributed feed system which performs distributed electric supply to load only for exchange using a storage battery and commercial alternating current power without going via a bidirectional DC-DC converter and a 2 winding electronic transformer, A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery, A 2 winding electronic transformer has two bidirectional input/output terminals with an intersection and direct-current two ways, And it has the strange recovery solid state switch provided in a high frequency transformer side, its storage battery side, and a load side, One bidirectional input/output terminal of the 2 winding electronic transformer concerned is connected to an output side of a source of direct current power, A bidirectional input/output terminal of another side has connected between commercial alternating current power and loads only for exchange to T shape, Alternating current power from commercial alternating current power is supplied to load only for exchange without going via a bidirectional DC-DC converter and a 2 winding electronic transformer, until a storage battery reaches a full charge by a source of direct current power, After changing a source of direct current power, and direct current power from a storage battery into a single-phase-full-waves rectification waveform by the half cycle sine wave abnormal conditions of a bidirectional DC-DC converter at the time of a full charge of a storage battery, or interruption to service of commercial alternating current power, A high-frequency-modulation phase of two pieces or two pairs of one-way solid state switches which constitutes a strange recovery solid state switch provided in the storage battery side of a high frequency transformer of a 2 winding electronic transformer is reversed by turns for every half cycle of commercial frequency, Get over by a strange recovery solid state switch provided in a load side of a high frequency transformer of a 2 winding electronic transformer, take out a sinusoidal wave alternative current output, and load only for exchange is supplied, While performing electric power supply from a fuel cell at the time of discharge advance of a storage battery and supplying alternating current power from commercial alternating current power to - midnight power feed time belt to load only for exchange at night, Use together bidirection which a 2 winding electronic transformer has, an intersection and a conversion-into-dc function, and rate rectifying operation of pressure-up type high tensile at the time of charge of a bidirectional DC-DC converter, and a storage battery is charged, When a storage battery is close to a full charge and commercial alternating current power is not interruption to service in the time of a light load, a distributed feed system changing direct current power into exchange, carrying out phase simulation to the commercial-alternating-current-power side automatically, and carrying out a head-tide style with the energy bidirectional transmission characteristic of a 2 winding electronic transformer is provided.

[0016]

In the 5th, at least one of a wind power generator, a photovoltaic power generation apparatus, and fuel cells. It is a distributed feed system which performs distributed electric supply to load only for exchange via a bidirectional DC-DC converter and a 3 winding electronic transformer using a storage battery and commercial alternating current power, A wind power generator, a photovoltaic power generation apparatus, and a fuel cell serve as a source of direct current power in which each rated-apparent-power voltage was unified into rated voltage of a storage battery, A 3 winding electronic transformer has three bidirectional input/output terminals with an intersection and direct-current two ways, And it has the strange recovery solid state switch provided in its high frequency transformer and commercial-alternating-current-power side, the storage battery side, and a load side, A source of direct current power and a storage battery and

commercial alternating current power, and load only for exchange are mutually insulated and connected by the 3 winding electronic transformer concerned, Alternating current power from commercial alternating current power is supplied to load only for exchange via a 3 winding electronic transformer until a storage battery reaches a full charge by a source of direct current power, After changing a source of direct current power, and direct current power from a storage battery into a single-phase-full-waves rectification waveform by the half cycle sine wave abnormal conditions of a bidirectional DC-DC converter at the time of a full charge of a storage battery, or interruption to service of commercial alternating current power, A high-frequency-modulation phase of two pieces or two pairs of one-way solid state switches which constitutes a strange recovery solid state switch provided in the storage battery side of a high frequency transformer of a 3 winding electronic transformer is reversed by turns for every half cycle of commercial frequency, Get over by a strange recovery solid state switch provided in a load side of a high frequency transformer of a 3 winding electronic transformer, take out a sinusoidal wave alternative current output, and load only for exchange is supplied, While performing electric power supply from a fuel cell at the time of discharge advance of a storage battery and supplying alternating current power from commercial alternating current power to - midnight power feed time belt to load only for exchange at night, Use together bidirection which a 3 winding electronic transformer has, an intersection and a conversion-into-dc function, and rate rectifying operation of pressure-up type high tensile at the time of charge of a bidirectional DC-DC converter, and a storage battery is charged, When a storage battery is close to a full charge and commercial alternating current power is not interruption to service in the time of a light load, a distributed feed system changing direct current power into exchange using the energy bidirectional transmission characteristic of a 3 winding electronic transformer, carrying out phase simulation to the commercial-alternating-current-power side automatically, and carrying out a head-tide style is provided.

[0017]

The 6th is provided with a distributed feed system, wherein storage of compressed water matter for the above-mentioned fuel cells is possible.

[Effect of the Invention]

[0018]

According to the invention of this application as above-mentioned, as illustrated, for example to drawing 3, when supplying exchange and a dc source to load directly, the part and efficiency which efficiency eta_1 of an inverter is removed compared with the conventional example of drawing 1 will be improved. Although it is possible to insert the device which served both as an insulation and transformation between commercial alternating current power and the apparatus for distributed power generation and it necessary to take the efficiency of eta_1' into consideration anew in this case from the reasons of security actually, Since it is just over or below 90%, efficiency eta_1' of the electronic transformer of the same capacity is 94 to 95% and efficiency eta_1 of DC-AC inverter of several kilowatts or less also including an insulating function becomes $eta_1 < eta_1$', the system by the invention of this application is excellent.

[Best Mode of Carrying Out the Invention]

[0019]

[A first embodiment]

Drawing 4 shows one embodiment of an invention of this application.

[0020]

In the embodiment shown in this drawing 4, first The wind power generator WTG (Wind Turbine Generator), It uses combining three, photovoltaic power generation apparatus PV (Photo Voltaic) and the fuel cell FC (Fuel Cell), and rated-apparent-power voltage serves as a source of direct current power unified into the rated voltage of the storage battery B (Battery), respectively. And the alternating current power from the commercial alternating current power Utility is supplied to an intersection and load Lac/dc both for a direct current until the storage battery B reaches a full charge by the sources WTG, PV, and FC of these direct current power, If the storage battery

B reaches a full charge, the direct current power from the storage battery B concerned will be supplied to an intersection and load Lac/dc both for a direct current, If discharge of the storage battery B progresses and the telophase of discharge is approached, it will be constituted so that the alternating current power from the commercial alternating current power Utility may be supplied to an intersection and load Lac/dc both for a direct current, and the change of the direct-current electric supply / exchange electric supply will be controlled by a control circuit (not shown).

[0021]

Charge of the storage battery B is usually performed by the wind power generator WTG and photovoltaic power generation apparatus PV, If it is daytime when those generating electric power is not enough, it will be performed by the fuel cell FC, and if it is a time zone when an electricity bill becomes cheap from - midnight, i.e., daytime, at night, it will be performed by - midnight power via battery-charger CHG1 at night.

[0022]

If the storage battery B reaches a full charge, the switch SW opens with the directions from a control circuit, and the exchange relay RL will be restored, and it will switch to DC power supply, and will continue at an intersection and load Lac/dc both for a direct current, and direct current power will be supplied.

[0023]

If the telophase of discharge of the storage battery B is approached, the switch SW will close with directions of a control circuit, and it returns to the exchange electric supply by the commercial alternating current power Utility.

[0024]

[A second embodiment]

Drawing 5 shows one another embodiment of an invention of this application.

[0025]

In the embodiment shown in this drawing 5, provide bidirectional DC-DC converter Conv and the 2 winding electronic transformer 2, and the 2 winding electronic transformer 2, It comprises strange recovery solid state switch SW3 which operates at the high frequency transformer HFT with consistency and the insulating function of the storage battery side voltage and load side voltage, and 10-50 kHz connected to the storage battery side winding and load side winding, SW2, and the filter F2 further connected to the load side.

[0026]

This 2 winding electronic transformer 2 has the two bidirectional input/output terminals 2a and 2b with an intersection and direct-current two ways, One bidirectional input/output terminal 2a was connected to the output side of the source of direct current power, and bidirectional input/output terminal 2b of another side has connected between the commercial alternating current power Utility, and intersections and load Lac/dc both for a direct current to T shape.

[0027]

In this circuitry, the alternating current power from the commercial alternating current power Utility is supplied to an intersection and load Lac/dc both for a direct current without going via the 2 winding electronic transformer 2, until the storage battery B reaches a full charge by the sources WTG, PV, and FC of direct current power, At the time of the full charge of the storage battery B, or interruption to service of the commercial alternating current power Utility, the sources WTG, PV, and FC of direct current power and the direct current power from the storage battery B are supplied to an intersection and load Lac/dc both for a direct current via the 2 winding electronic transformer 2, While performing electric power supply from the fuel cell FC at the time of discharge advance of the storage battery B and supplying the alternating current power from the commercial alternating current power Utility to - midnight power feed time belt to an intersection and load Lac/dc both for a direct current at night, The storage battery B is charged with the bidirection, and the intersection and the conversion-into-dc function which the 2 winding electronic transformer 2 has.

[0028]

And change of the battery voltage accompanying ** and discharge adjusts the voltage variation

of the storage battery B with the voltage adjustment function of bidirectional DC-DC converter Conv regardless of the time of - discharge at the time of charge, and can supply now the voltage stable in an intersection and load Lac/dc both for a direct current.
[0029]
Since energy transmission of right and reverse both directions by bidirection, and an intersection and a conversion-into-dc function is possible for the 2 winding electronic transformer 2, it can be interlocked with bidirectional DC-DC converter Conv, and can play the role of the battery charger (CHG in drawing 1) of - midnight power at night.
[0030]
[A third embodiment]
Drawing 6 shows one another embodiment of an invention of this application.
[0031]
In the embodiment shown in this drawing 6, in order to adjust the insulation between the commercial alternating current power Utility, and an intersection and load Lac/dc both for a direct current, and change of power supply voltage, The 3 winding electronic transformer 3 which has the three bidirectional input/output terminals 3a, 3b, and 3c with an intersection and direct-current two ways is provided, and it has composition which insulated the sources WTG, PV, and FC of direct current power and the storage battery B and the commercial alternating current power Utility, and an intersection and load Lac/dc both for a direct current mutually, and was connected. The high frequency transformer HFT in which the 3 winding electronic transformer 3 has consistency and the insulating function of the storage battery side voltage and load side voltage, It comprises strange recovery solid state switch SW1 which operates at 10-50 kHz connected to the commercial-alternating-current-power side winding, storage battery side winding, and load side winding, SW3, SW2, and filter F1 further connected to the commercial-alternating-current-power side and the load side and F2.
[0032]
In this circuitry, the alternating current power from the commercial alternating current power Utility is supplied to an intersection and load Lac/dc both for a direct current via the 3 winding electronic transformer 3 until the storage battery B reaches a full charge by the sources WTG, PV, and FC of direct current power, At the time of the full charge of the storage battery B, or interruption to service of the commercial alternating current power Utility, the sources WTG, PV, and FC of direct current power and the direct current power from the storage battery B are supplied to an intersection and load Lac/dc both for a direct current via the 3 winding electronic transformer 3, While performing electric power supply from the fuel cell FC at the time of discharge advance of the storage battery B and supplying the alternating current power from the commercial alternating current power Utility to - midnight power feed time belt to an intersection and load Lac/dc both for a direct current at night, The bidirection, and the intersection and the conversion-into-dc function which the 3 winding electronic transformer 3 has perform charge B of a storage battery.
[0033]
To the voltage variation of the commercial alternating current power Utility, voltage adjustment is possible here by Pulse-Density-Modulation (PWM) control or pulse-phase-modulation (ppm) control of strange recovery solid state switch SW1 and SW2, The load voltage stable to change of the commercial alternating current power Utility and the sources WTG, PV, and FC of direct current power can be supplied, and charge according to - midnight power through strange recovery solid state switch SW1 and SW3 at night is also simultaneously possible.
[0034]
It is circuitry which changes alternating current power or direct current power by contact CT1 of the exchange relay RL, CT2, and CT3, and supplies electric power to an intersection and load Lac/dc both for a direct current in the above drawing 5 and the embodiment of drawing 6, It consumes by a load side, without carrying out the head-tide style (system cooperation) of the energy of the wind power generator WTG, photovoltaic power generation apparatus PV, and the fuel cell FC to the commercial-alternating-current-power side via the storage battery B.
[0035]

[A fourth embodiment]
Drawing 7 and drawing 8 show one another embodiment of an invention of this application respectively. According to the embodiment shown in these drawing 7 and drawing 8, it is a thing in which a head-tide style is possible by linking the storage battery B and bidirectional DC-DC converter Conv directly. Although the head-tide style is accepted about wind power generation and photovoltaics although it does not approve, and it is unknown now about the head-tide style at the time of fuel cell power generation to carry out the head-tide style of the - midnight power in a domestic electricity-sales-to-utilities contract at night, if it sees from a pure engineering perspective, all head-tide styles will become possible.
[0036]
In this embodiment, first, until the storage battery B reaches a full charge by the sources WTG, PV, and FC of direct current power, The alternating current power from the commercial alternating current power Utility is supplied to the load Lac only for exchange via the 3 winding electronic transformer 5 by drawing 8 at drawing 7 without going via bidirectional DC-DC Comber Conv and the 2 winding electronic transformer 4. At the time of the full charge of the storage battery B, or interruption to service of the commercial alternating current power Utility. After changing the sources WTG, PV, and FC of direct current power, and the direct current power from the storage battery B into a single-phase-full-waves rectification waveform by the half cycle sine wave abnormal conditions of bidirectional DC-DC converter Conv, The high-frequency-modulation phase of two pieces or two pairs (a total of four pieces) of one-way solid state switches (not shown) which constitutes strange recovery solid state switch SW3 connected to the storage battery side of the high frequency transformer HFT of 2 winding electronic transformer 4 (drawing 7) and the 3 winding electronic transformer 5 (drawing 8). It reverses by turns for every half cycle of commercial frequency, it gets over by strange recovery solid state switch SW2 connected to the load side of the high frequency transformer HFT, a sinusoidal wave alternative current output is taken out, and the load Lac only for exchange is supplied. At the time of discharge advance of the storage battery B, electric power supply is performed from the fuel cell FC. On - midnight power feed time belt, while supplying the alternating current power from the commercial alternating current power Utility to the load Lac only for exchange, at night, The bidirection which 2 winding electronic transformer 4 (drawing 7) and the 3 winding electronic transformer 5 (drawing 8) have, an intersection and a conversion-into-dc function, and the rate rectifying operation of pressure-up type high tensile at the time of charge of bidirectional DC-DC converter Conv are used together, and the storage battery B is charged. When the storage battery B is close to a full charge and the commercial alternating current power Utility is not interruption to service in the time of a light load, It changes into exchange using the bidirectional transmission characteristic of the energy which 2 winding electronic transformer 4 (drawing 7) and the 3 winding electronic transformer 5 (drawing 8) have, and phase simulation of the direct current power is carried out automatically, and a head-tide style is carried out to the commercial-alternating-current-power side.
[0037]
Here, the drive system of bidirectional DC-DC converter Conv in the embodiment of drawing 7 is more concretely explained using drawing 9 and drawing 10. Drawing 9 shows the example of inverter operation in the case of carrying out the head-tide style of drawing 10 from the storage battery B to an intersection and load Lac/dc both for a direct current, or the commercial alternating current power Utility at night at the time of charge of - midnight power etc.
[0038]
In both figures, the switch S7 and S8 which constitute bidirectional DC-DC converter Conv (refer to drawing 7), and the diode D7 and D8 have taken unification with the circuit element sign in below-mentioned drawing 11 - drawing 14. Other signs are the same as that of drawing 4 - drawing 8. Actually, as illustrated to below-mentioned drawing 13, two pairs (a total of four pieces) of one-way solid state switches (not shown) can constitute strange recovery solid state switch SW3 (refer to drawing 7) by the side of the storage battery in the 2 winding electronic transformer 4 from the case of the two one-way solid state switches S5, S6, or a bridge. Strange recovery solid state switch SW2 (refer to drawing 7) of a load side can consist of the

two switches S3 and S4, as illustrated to drawing 13.
[0039]
In the case where strange recovery solid state switch SW3 by the side of a storage battery is constituted by the two one-way solid state switches S5 and S6, The one-way solid state switch S5 and S6 (refer to drawing 13) by changing the driving phase of a modulated wave for every half cycle of commercial frequency, When the switch S3 by the side of a load side and commercial alternating current power and S4 (refer to drawing 13) are sinusoidal wave alternative currents, the dc output voltage 6 of 2 phase half wave occurs to the both ends of the capacitor C6 of bidirectional DC-DC converter Conv (refer to drawing 9 and drawing 13), And the switch S8 in drawing 9 is driven by the usual IC (PFC-IC) only for pressure-up type power factor improvement, the switch S7 is stopped by one side, and the storage battery B is charged with the energy stored in the choke coil CH through the diode D7. Because of pressure-up operation, voltage higher than the output peak magnitude of the 2 winding electronic transformer 4 occurs, and sufficient charge is possible for the charge voltages of the storage battery B.
[0040]
On the other hand, in the case of the inverter operation which generates a sinusoidal wave alternative current from the storage battery B, As shown in drawing 10, the switch S7 is driven with the PWM signal by which sinusoidal abnormal conditions were carried out, and 2 phase half wave or the single-phase-full-waves rectification output 6 is generated in the filter output side which comprised the choke coil CH and the capacitor C6. Although high frequency modulation (10k-50kHz) of this output is carried out by the one-way solid state switch S5 of strange recovery solid state switch SW3, and S6 (refer to drawing 7 and drawing 13), The driving phase of a modulated pulse is reversed for every half cycle of commercial frequency by one-way solid state switch S5 and S6 (refer to drawing 7 and drawing 13) side so that it may become a sine wave by the switch [of strange recovery solid state switch SW2] S3, and S4 (refer to drawing 7 and drawing 13) side at this time. Thus, a sinusoidal wave alternative current output can be taken out to the output side [of the 2 winding electronic transformer 4], i.e., load side, and commercial-alternating-current-power side.
[0041]
In the turn ratio which insulates thoroughly the commercial alternating current power Utility, the load Lac only for exchange, and a storage battery B system using the 3 winding electronic transformer 5 of drawing 8, and is completely adjusted also to each pressure value by the same technique, The envelope modulation operation in sinusoidal commercial alternating current frequency of the high frequency transformer HFT becomes possible altogether, and all loads become usable in the conventional load Lac only for exchange.
[0042]
Although an above embodiment is a thing at the time of combining all three, the wind power generator WTG, photovoltaic power generation apparatus PV, and the fuel cell FC, Even when only one of them is used, and even when arbitrary two are combined, to say nothing of the invention of this application being applicable, the similarly outstanding distributed feed system can be realized.
[Example 1]
[0043]
Drawing 11 shows one more concrete example of the embodiment of drawing 5. Since the numerals currently used are in agreement with the numerals in drawing 5, only the numerals added here are explained.
[0044]
First, TM is a timer for - midnight power charge in an intersection, direct-current electric supply, and the night, and is controlled by control circuit CONT-2. CONT-1 is a control circuit of the windmill power plant WTG, and when the windmill power plant WTG is exchange, in a ready sink and a direct current, it becomes a usually publicly known control circuit which performs voltage adjustment as it is like the dynamo for cars. S3 and S4 are bidirectional solid state switches, and perform switching an intersection and both for a direct current by making two one-way solid state switches into back matching (Back to Back Connection) as the enlarged drawing in a

figure. S5-S8 are one-way solid state switches, and a capacitor and CH are choke coils a diode with built-in or outside in D5-D8, and C1-C6. N2-N4 are winding of the high frequency transformer HFT.

[0045]

In the example of this drawing 11, at the time of the exchange electric supply from the commercial alternating current power Utility, the one-way solid state switch S5, S6, and S7 are stopped, and direct current voltage occurs to the both ends of the capacitor C6 through the bidirectional solid state switch S3, S4, the high frequency transformer HFT and the diode D5, and D6. Voltage adjustment of this direct current voltage is carried out by the one-way solid state switch S8 and the diode D7, and charge of the storage battery B is attained and supplies alternating current power to an intersection and load Lac/dc both for a direct current simultaneously with it. The charge from the commercial alternating current power Utility does not mainly interfere the wind power generation which does not ask photovoltaics in the daytime or time zone as ** or zero. At the time of interruption to service of the commercial alternating current power Utility, it changes to the direct-current electric supply from the sources WTG, PV, and FC of direct current power, and the storage battery B promptly by restoration of the exchange relay RL, electric power is supplied to direct current power by the load side through the 2 winding electronic transformer 2, and an intersection and load Lac/dc both for a direct current maintain operation. At this time, only the one-way solid state switch S8 stops operation, and controls that is, adjusts [pressure-lowering] direct current voltage for the one-way solid state switch S7 and the diode D8. It can also discharge by operating the fuel cell FC with discharge of the storage battery B.

[0046]

The above explanation is when the interruption time of the commercial alternating current power Utility is long, but. When there is no interruption to service and the storage battery B reaches a full charge, distributed electric supply by natural power sources and a fuel cell can be realized by making the switch SW off by timer TM, and changing to direct-current electric supply by instructions of control circuit CONT-2.

[Example 2]

[0047]

Drawing 12 shows one more concrete example of the embodiment of drawing 6. It is as having mentioned above to insulate each power supply and load by using an electronic transformer as 3 winding in the example of this drawing 12, and to stabilize change of the commercial alternating current power Utility by PWM or ppm control further. The outline of operation of the 3 winding electronic transformer 3 in this case is as follows.

[0048]

Drawing 15 (a), (b), and (c) is a wave form chart for explaining the operation outline of the 3 winding electronic transformer 3 respectively. After, as for a left-hand side waveform, input commercial alternating current voltage passes along filter F1 in drawing 15 (a), the ac input side edge child voltage of the three winding transformer 3 is shown. As the half bridge circuit where this input waveform consists of C1, C2, S1, and S2 showed to the center section of drawing 15 (a), high frequency ring modulation is carried out, and it is added to the primary winding N1 of the high frequency transformer HFT. Now, when the number of turns of the secondary winding N2 is the same as that of the primary winding N1, voltage twice the voltage of generating in the secondary winding N2 with the half bridge (operation as [In this case] a voltage doubler circuit) constituted by S3, S4, C3, and C4 gets over. S1, S3, S2, and S4 shall drive the driving timing of the switch in this case to the same timing. namely, -- the sinusoidal wave alternative current waveform which is the HARASHIN item is reproduced as it is by high frequency strange recovery art at the recovery side -- high frequency modulation -- a transformer -- small size -- a weight saving is carried out and efficiency also improves compared with a commercial transformer. At this time, it cannot be overemphasized that the diode D5 and D6 rectify the winding N3 and the high-frequency ac generated in N4, and charge of the storage battery B can be performed by bidirectional DC-DC converter Conv.

[0049]

Next, at the time of interruption to service of the commercial alternating current power Utility, or the full charge of the storage battery B, although the rectangular wave signal of high frequency occurs by the inverter circuit of a push pull, by the winding N3 of the high frequency transformer HFT, N4, and the solid state switch S5 and S6, By a voltage doubler circuit, the rectangular wave voltage generated in the winding N2 by S3 and S4 at this time serves as a direct current with a twice as many pressure value as this, and supplies direct current power to an intersection and load Lac/dc both for a direct current. That is, the electronic transformer which operates by high frequency strange recovery can change voltage regardless of an intersection and a direct current.

[0050]

Drawing 15 (b) illustrates the voltage of the high frequency transformer HFT in case a dc input is added to the winding N3 and N4 in the center section. Drawing 15 (c) shows an example in the case of performing publicly known PWM control on S3 by the side of a secondary winding, and S4 switch, and adjusting the voltage of a load side to them. Although the case of the exchange strange recovery was illustrated, it cannot be overemphasized that it is completely similarly controllable in a dc input.

[0051]

By creating the pressure fuel Fuel for the fuel cells FC (mainly hydrogen) with the compressor COMP at the time of a light load, and storing it as a part of load, If it uses for the object for home generations of electricity, and electric motors, it will be useful also for the environmental improvement with which the reduction of a battery rating, equalization of a load change, and a clean engine-ized time were equipped.

[Example 3]

[0052]

Drawing 13 and drawing 14 show drawing 7 and one more concrete example of the embodiment of drawing 8 respectively, Lose restrictions of the intersection and load Lac/dc both for a direct current in drawing 11 and drawing 12, and compatibility with the existing facility only for exchange is thought as important, A head-tide style is also simultaneously made possible through an electronic transformer at the commercial-alternating-current-power Utility side from a dc source, Drawing 13 is a thing at the time of connecting with the commercial alternating current power Utility and the load Lac only for exchange via the 2 winding electronic transformer 4 only by the side of the storage battery B, Drawing 14 is a thing at the time of insulating the sources WTG, PV, and FC of direct current power, and the commercial alternating current power Utility and the load Lac only for exchange mutually, and connecting via the 3 winding electronic transformer 5. [the storage battery B, and]

[0053]

The big point of difference in comparison with drawing 11 and drawing 12 has the one-way solid state switch S5 and S6 in the point that all are operating at the time of ** and discharge. In [as shown in drawing 9 and drawing 10] bidirectional DC-DC converter Conv, Battery voltage, 2 phase half wave, or the single-phase-full-waves rectification output 6 is changed into right and reverse both directions, exchange abnormal conditions or recovery conversion is performed in the one-way solid state switch S5 and S6, and it is made to always operate only by exchange modulation components within 2 winding electronic transformer 4 and the 3 winding electronic transformer 5. By this, an ac output can always be taken out regardless of exchange electric supply / direct-current electric supply to the load side only for exchange.

[0054]

In order to realize this operation, as illustrated, for example to drawing 16 (a) and (b), the drive pulse phase of the switches S1-S6 of the 3 winding electronic transformer 5 The period of the positive half cycle of the commercial alternating current power Utility, and a negative half cycle, While v_1 and the v_2 always operate with an AC-sine-waves form and direct-current input and output of single phase full waves or a two-layer half wave always occur for v_3 terminal of a direct-current circuit by reversing by turns, The change of the magnetic flux of the 3 winding electronic transformer 5 can make the exchange modulation operation always illustrated to

above-mentioned drawing 15 (a) perform.
[0055]
In the case of the two-winding transformer 4 of drawing 13, in the example of drawing 16, when there is no N1, it corresponds, and it cannot be overemphasized that other operations are completely the same.
[0056]
Anyway, the point in which the bidirectional transmission of power energy is possible from a direct current to several 100 Hertz exchange is a greatly different point from a commercial source voltage machine among 2 sets, the 2 winding electronic transformer 4 and the 3 winding electronic transformer 5, or 3 sets of input/output terminals, This has been the basic feature of the system configuration of the invention in this application.
[0057]
Unless another feature has interruption to service of the commercial alternating current power Utility, it becomes possible to perform a head-tide style from the storage battery side to the commercial-alternating-current-power side through 2 winding electronic transformer 4 and the 3 winding electronic transformer 5. It cannot be overemphasized that the oscillator for inverter operation at the time of interruption to service is built in in this case.
[0058]
Of course, the invention of this application is not limited to the above embodiment and example, and various modes are possible for it about details.
[Industrial applicability]
[0059]
The large natural-power-sources system electric power of a change factor and stable electric power, such as midnight power and a fuel cell, are combined by the invention of this application as explained in detail above, The new distributed feed system which can supply stable electric power to load via the electronic transformer used in common with the usage rate near about 100%, can raise the rate of cost / performance of the whole system, and can attain spreading and promotion and energy saving of distributed electric supply is provided.
[Brief Description of the Drawings]
[0060]
[Drawing 1]It is the figure which classified the propriety of the conformity of the intersection and direct-current electric supply of the conventional electrical household appliances and electrical equipment in the case of using an intersection and a direct-current energy source for a distributed feed system in a low-pressure power distribution system.
[Drawing 2]It is a figure showing the conventional example of the photovoltaics in the case of supplying an intersection and a direct-current energy source to load directly in a low-pressure power distribution system, and wind power generation.
[Drawing 3]It is a figure for explaining an example at the time of connecting an electric supply system, and an intersection and the load both for a direct current according to the invention of this application.
[Drawing 4]It is a figure showing one embodiment of an invention of this application.
[Drawing 5]It is a figure showing one another embodiment of an invention of this application.
[Drawing 6]It is a figure showing one another embodiment of an invention of this application.
[Drawing 7]It is a figure showing one another embodiment of an invention of this application.
[Drawing 8]It is a figure showing one another embodiment of an invention of this application.
[Drawing 9]It is a figure for explaining operation of the bidirectional DC-DC converter in the embodiment of drawing 7.
[Drawing 10]It is a figure for explaining operation of the bidirectional DC-DC converter in the embodiment of drawing 7.
[Drawing 11]It is a figure showing one example of an invention of this application.
[Drawing 12]It is a figure showing one another example of an invention of this application.
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[Drawing 14]It is a figure showing one another example of an invention of this application.
[Drawing 15]It is a figure for explaining the operation outline of a 3 winding electronic

transformer.
[Drawing 16]It is a figure for explaining the conversion-into-dc principle of operation of a 3 winding electronic transformer.
[Description of Notations]
[0061]
A Lac/dc intersection and the load both for a direct current
Lac Load only for exchange
Utility commercial alternating current power
WTG Windmill power plant
PV Photovoltaic power generation apparatus
FC Fuel cell
B Storage battery
Conv Bidirectional DC-DC converter
S7 and S8 One-way solid state switch
D7 and D8 Diode
C5 and C6 Capacitor
CH Choke coil
1 Battery charger CHG
2 2 winding electronic transformer
2a and 2b Bidirectional input/output terminal
HFT High frequency transformer
N2-N4 Winding
F2 Filter
SW2 and SW3 Strange recovery solid state switch
S3 and S4 Bidirectional solid state switch
S5 and S6 One-way solid state switch
D5 and D6 Diode
C3 and C4 Capacitor
3 3 winding electronic transformer
3a, 3b, and 3c Bidirectional input/output terminal
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5 3 winding electronic transformer
5a, 5b, and 5c Bidirectional input/output terminal
HFT High frequency transformer
N1-N4 Winding
F1 and F2 Filter
SW1-SW3 Strange recovery solid state switch

S1 - S4 Bidirectional solid state switch
S5 and S6 One-way solid state switch
D5 and D6 Diode
C1-C4 Capacitor
6 Dc output voltage of single phase full waves or 2 phase half wave
D1-D4 Diode
SW Switch
RL Exchange relay
CT1, CT2, and CT3 Exchange relay contact
TM Timer
CONT-1 Wind-power-generation control device
CONT-2 Distributed power supply controller
T Tag block
COMP Compressor
Fuel Fuel for fuel cells
AC Exchange
DC Direct current
I_c charging current
I INV inverter current
IB Storage battery current
EB Battery voltage

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
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[Translation done.]

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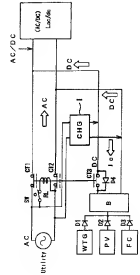
(54)【発明の名称】分散給電システム

(57)【要約】
【目的】　変動要因の大きい自然エネルギー系電力と深夜電力や燃料電池等の安定電力とを組み合わせて、ほぼ１００%に近い使用率で共通に利用される電子変圧器を介して負荷に安定電力を供給し、システム全体の価格・性能比率を高め、分散給電の普及促進と省エネルギー化を図ることのできる、新しい分散給電システムを提供する。
【構成】　風力発電装置ＷＴＧ、太陽光発電装置ＰＶ、燃料電池ＦＣおよび蓄電池Ｂならびに商用交流電源Utilityを用いて、交・直流両用負荷Lac/dcへの分散給電を行う分散給電システムであって、風力発電装置ＷＴＧ、太陽光発電装置ＰＶおよび燃料電池ＦＣは、各々の定格電力電圧が蓄電池Ｂの定格電圧に統一された直流電力源となっており、蓄電池Ｂが前記直流電力源により満充電に達するまでは商用交流電源Utilityからの交流電力を交・直流両用負荷Lac/dcへ供給し、蓄電池Ｂの満充電時には当該蓄電池Ｂからの直流電力を交・直流両用負荷Lac/dcへ供給し、蓄電池Ｂの放電終期に近づくと商用交流電源Utilityからの交流電力を交・直流両用負荷La



【特許請求の範囲】
【請求項１】
風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、交・直流両用負荷への分散給電を行う分散給電システムであって、
風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、
蓄電池が当該直流電力源により満充電に達するまでは商用交流電源からの交流電力を交・直流両用負荷へ供給し、
蓄電池の満充電時には当該蓄電池からの直流電力を交・直流両用負荷へ供給し、
蓄電池の放電終期に近づくと商用交流電源からの交流電力を交・直流両用負荷へ供給するようになっていることを特徴とする分散給電システム。
【請求項２】
風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、二巻線電子変圧器を経由してもしくは経由しないで交・直流両用負荷への分散給電を行う分散給電システムであって、
風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、
二巻線電子変圧器は交・直流両用で２つの双方向入出力端子を有しており、
当該二巻線電子変圧器の一方の双方向入出力端子は直流電力源の出力側に接続され、他方の双方向入出力端子は商用交流電源と交・直流両用負荷との間をＴ字型に接続しており、
蓄電池が直流電力源により満充電に達するまでは商用交流電源からの交流電力を二巻線電子変圧器を経由しないで交・直流両用負荷へ供給し、
蓄電池の満充電時もしくは商用交流電源の停電時には直流電力源および蓄電池からの直流電力を二巻線電子変圧器を経由して交・直流両用負荷へ供給し、
蓄電池の放電進行時には燃料電池から電力補給を行い、
夜間・深夜電力供給時間帯には商用交流電源からの交流電力を交・直流両用負荷へ供給するとともに、二巻線電子変圧器の有する双方向性と交・直流変換機能とにより蓄電池の充電を行うようになっていることを特徴とする分散給電システム。
【請求項３】
風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、三巻線電子変圧器を経由して交・直流両用負荷への分散給電を行う分散給電システムであって、
風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、
三巻線電子変圧器は交・直流両用で３つの双方向入出力端子を有しており、
直流電力源および蓄電池と商用交流電源と交・直流両用負荷とは当該三巻線電子変圧器によって相互に絶縁して接続されており、
蓄電池が直流電力源により満充電に達するまでは商用交流電源からの交流電力を三巻線電子変圧器を経由して交・直流両用負荷へ供給し、
蓄電池の満充電時もしくは商用交流電源の停電時には直流電力源および蓄電池からの直流電力を三巻線電子変圧器を経由して交・直流両用負荷へ供給し、
蓄電池の放電進行時には燃料電池から電力補給を行い、
夜間・深夜電力供給時間帯には商用交流電源からの交流電力を交・直流両用負荷へ供給するとともに、三巻線電子変圧器の有する双方向性と交・直流変換機能とにより蓄電池の充電を行うようになっていることを特徴とする分散給電システム。
【請求項４】
風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、双方向ＤＣ－ＤＣコンバータおよび二巻線電子変圧器を経由し

てもしくは経由しないで交流専用負荷への分散給電を行う分散給電システムであって、
風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、
二巻線電子変圧器は交・直流両用で２つの双方向入出力端子を有し、且つ高周波変圧器とその蓄電池側および負荷側に設けられた変復調半導体スイッチとを有しており、
当該二巻線電子変圧器の一方の双方向入出力端子は直流電力源の出力側に接続され、他方の双方向入出力端子は商用交流電源と交流専用負荷との間をＴ字型に接続しており、
蓄電池が直流電力源により満充電に達するまでは商用交流電源からの交流電力を双方向ＤＣ－ＤＣコンバータおよび二巻線電子変圧器を経由しないで交流専用負荷へ供給し、
蓄電池の満充電時もしくは商用交流電源の停電時には、直流電力源および蓄電池からの直流電力を双方向ＤＣ－ＤＣコンバータの半サイクル正弦波変調により単相全波整流波形に変換した後、二巻線電子変圧器の高周波変圧器の蓄電池側に設けられた変復調半導体スイッチを構成する２個または２対の単方向半導体スイッチの高周波変調位相を商用周波数の半サイクル毎に交互に逆転し、二巻線電子変圧器の高周波変圧器の負荷側に設けられた変復調半導体スイッチにより復調して正弦波交流出力を取り出して交流専用負荷へ供給し、
蓄電池の放電進行時には燃料電池から電力補給を行い、
夜間・深夜電力供給時間帯には商用交流電源からの交流電力を交流専用負荷へ供給するとともに、二巻線電子変圧器の有する双方向性および交・直流変換機能ならびに双方向ＤＣ－ＤＣコンバータの充電時の昇圧型高力率整流動作を併用して蓄電池の充電を行い、
軽負荷時で蓄電池が満充電に近く且つ商用交流電源が停電でないときは直流電力を二巻線電子変圧器のエネルギー双方向伝送特性によって交流に変換し、商用交流電源側に自動的に位相同期して逆潮流させるようになっていることを特徴とする分散給電システム。

【請求項５】

風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、双方向ＤＣ－ＤＣコンバータおよび三巻線電子変圧器を経由して交流専用負荷への分散給電を行う分散給電システムであって、
風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、
三巻線電子変圧器は交・直流両用で３つの双方向入出力端子を有し、且つ高周波変圧器とその商用交流電源側および蓄電池側および負荷側に設けられた変復調半導体スイッチを有し、
直流電力源および蓄電池と商用交流電源と交流専用負荷とは当該三巻線電子変圧器によって相互に絶縁して接続されており、
蓄電池が直流電力源により満充電に達するまでは商用交流電源からの交流電力を三巻線電子変圧器を経由して交流専用負荷へ供給し、
蓄電池の満充電時もしくは商用交流電源の停電時には、直流電力源および蓄電池からの直流電力を双方向ＤＣ－ＤＣコンバータの半サイクル正弦波変調により単相全波整流波形に変換した後、三巻線電子変圧器の高周波変圧器の蓄電池側に設けられた変復調半導体スイッチを構成する２個または２対の単方向半導体スイッチの高周波変調位相を商用周波数の半サイクル毎に交互に逆転し、三巻線電子変圧器の高周波変圧器の負荷側に設けられた変復調半導体スイッチにより復調して正弦波交流出力を取り出して交流専用負荷へ供給し、
蓄電池の放電進行時には燃料電池から電力補給を行い、
夜間・深夜電力供給時間帯には商用交流電源からの交流電力を交流専用負荷へ供給するとともに、三巻線電子変圧器の有する双方向性および交・直流変換機能ならびに双方向ＤＣ－ＤＣコンバータの充電時の昇圧型高力率整流動作を併用して蓄電池の充電を行い、
軽負荷時で蓄電池が満充電に近く且つ商用交流電源が停電でないときは直流電力を三巻線電子変圧器のエネルギー双方向伝送特性を用いて交流に変換し、商用交流電源側に自動的に位相同期して逆潮流させるようになっていることを特徴とする分散給電システム。

【請求項６】
燃料電池用圧縮水素の貯蔵が可能となっていることを特徴とする請求項１ないし５のいずれかに記載の分散給電システム。
【発明の詳細な説明】
【技術分野】
【０００１】
この出願の発明は、分散給電システムに関するものである。さらに詳しくは、この出願の発明は、自然エネルギーと燃料電池および夜間・深夜電力の蓄電エネルギーを組み合わせた分散給電に有用であって、特に複数の交・直流エネルギー源を電子変圧器とダイオード、オア回路により相互接続して効率良く負荷に電力を供給することのできる、新しい分散給電システムに関するものである。
【背景技術】
【０００２】
クリーン・エネルギーの代表例として、太陽光発電が普及してきている。また、風力発電も一部地域で導入されている。これら自然エネルギーは天候や気象条件の変化のため、日照時間や風車の稼働時間比率、さらに発生電力が常に変動し、電力の安定供給が困難であり、現状は商用電力を主としながら、補助的なエネルギー源として利用される例が多い。
【０００３】
しかしながら、地球温暖化を抑制する２１世紀の電力供給システムは地球規模で検討が進められており、原子力、火力および水力といった集中発電に加えて消費地域に密着した分散給電による効率の良い電力供給手段が種々検討されつつある。
【０００４】
さらに、従来の上記集中発電においても、昼夜間の消費電力量の大幅な変動を平準化して発送電系統の効率的運用を図るため、夜間・深夜電力を有効利用する制度が導入されてもいる。
【０００５】
一方、パワー・エレクトロニクス分野では、従来の鋼鉄型変圧器では実現することのなかった交・直流両用の電子変圧器が開発され、エネルギー源の交流・直流を問わず電力変換が可能になっている。したがって、商用電源や風力発電のような交流電力と太陽光、燃料電池、深夜電力貯蔵用電池のような直流電力とが電子変圧器によって結ばれ、各エネルギー源の開閉により、交流電力と直流電力が、半サイクル以内の瞬断を許容する無停電電源として各家庭・事務所等で利用可能になる。
【発明の開示】
【発明が解決しようとする課題】
【０００６】
現在、国内で普及している家電機器で確実に交・直流両用可能な機種としては電球、インバータ型蛍光灯、電動工具などがあり、エアコン、冷蔵庫、電子レンジ、掃除機、パソコン、ＦＡＸなどは一部に倍電圧整流回路や交流保護回路の組み込まれた機種を除き、インバータ型であれば原則的に使用可能である。一方、サイリスタ位相制御方式の調光器や暖房器具、炊飯器は直流での使用不能というのが現状である。したがって、当面は交流専用の機器と交・直流両用の家電機器とは屋内配線系統（コンセント）を分けて使用しなければならない不便さはある。
【０００７】
しかしながら、従来方式は直流発電エネルギーをインバータを通して常に商用交流に逆変換し、実負荷内で再度直流に変換し、さらに高周波インバータや可変周波数交流電力に変換して電動機やコンプレッサーを駆動するため、変換ロスが多い。
【０００８】
図１は、低圧配電系において、交・直流エネルギー源を分散給電システムに使用する場合における従来の家電機器の交・直流給電の適合性の可否を分類した図であり、それらと

変換効率との関係を示している。たとえば、太陽光発電から蛍光灯を点灯させる場合の効率はη_1，η_2，η_3であり、パソコンやＦＡＸを動作させる場合はη_1，η_2，η_3，η_4となる。

【０００９】

また図２は、低圧配電系において、交・直流エネルギー源を直接負荷に供給する場合における太陽光発電と風力発電の従来例を示したものである。この図２に例示したように、従来は、太陽光は系統連繋インバータ（通称：パワー・コンディショナ）を介して商用交流電源と負荷の両方に直接電力を供給し、風力発電は発生電力の時間変動が激しいため、蓄電池に蓄えた後、充・放電機能を持つ双方向コンバータを介して系統連繋を行うというように、それぞれ別個のシステムとして構成されてきた。太陽光については、日中の有効電力発生時間は晴天時でも６～８時間であり、一方風力発電の週間または月間発電時間比率は季節や地域によって大きく変わるが、我国の平均的な発電時間比率は太陽光の発電時間比率よりも低いと見られている。これが、欧米に比べて普及が進んでいない一因でもある。

【００１０】

このように稼動比率の低いエネルギー発生源の電力毎にインバータ等の制御機器を設けていたのでは、システム全体のコストが上がり、普及を阻害する一因となる。

【００１１】

そこで、この出願の発明は、以上のとおりの事情に鑑み、これら変動要因の大きい自然エネルギー系電力と深夜電力や燃料電池等の安定電力とを組み合わせて、ほぼ１００％に近い使用率で共通に利用される電子変圧器を介して負荷に安定電力を供給し、システム全体の価格・性能比率を高め、分散給電の普及促進と省エネルギー化を図ることのできる、新しい分散給電システムを提供することを課題としている。

【課題を解決するための手段】

【００１２】

この出願の発明は、上記の課題を解決するものとして、第１には、風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、交・直流両用負荷への分散給電を行う分散給電システムであって、風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、蓄電池が当該直流電力源により満充電に達するまでは商用交流電源からの交流電力を交・直流両用負荷へ供給し、蓄電池の満充電時には当該蓄電池からの直流電力を交・直流両用負荷へ供給し、蓄電池の放電終期に近づくと商用交流電源からの交流電力を交・直流両用負荷へ供給するようになっていることを特徴とする分散給電システムを提供する。

【００１３】

第２には、風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、二巻線電子変圧器を経由してもしくは経由しないで交・直流両用負荷への分散給電を行う分散給電システムであって、風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、二巻線電子変圧器は交・直流両用で２つの双方向入出力端子を有しており、当該二巻線電子変圧器の一方の双方向入出力端子は直流電力源の出力側に接続され、他方の双方向入出力端子は商用交流電源と交・直流両用負荷との間をＴ字型に接続しており、蓄電池が直流電力源により満充電に達するまでは商用交流電源からの交流電力を二巻線電子変圧器を経由しないで交・直流両用負荷へ供給し、蓄電池の満充電時もしくは商用交流電源の停電時には直流電力源および蓄電池からの直流電力を二巻線電子変圧器を経由して交・直流両用負荷へ供給し、蓄電池の放電進行時には燃料電池から電力補給を行い、夜間・深夜電力供給時間帯には商用交流電源からの交流電力を交・直流両用負荷へ供給するとともに、二巻線電子変圧器の有する双方向性と交・直流変換機能とにより蓄電池の充電を行うようになっていることを特徴とする分散給電システムを提供する。

【００１４】

第３には、風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、三巻線電子変圧器を経由して交・直流両用負荷への分散給電を行う分散給電システムであって、風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、三巻線電子変圧器は交・直流両用で３つの双方向入出力端子を有しており、直流電力源および蓄電池と商用交流電源と交・直流両用負荷とは当該三巻線電子変圧器によって相互に絶縁して接続されており、蓄電池が直流電力源により満充電に達するまでは商用交流電源からの交流電力を三巻線電子変圧器を経由して交・直流両用負荷へ供給し、蓄電池の満充電時もしくは商用交流電源の停電時には直流電力源および蓄電池からの直流電力を三巻線電子変圧器を経由して交・直流両用負荷へ供給し、蓄電池の放電進行時には燃料電池から電力補給を行い、夜間・深夜電力供給時間帯には商用交流電源からの交流電力を交・直流両用負荷へ供給するとともに、三巻線電子変圧器の有する双方向性と交・直流変換機能とにより蓄電池の充電を行うようになっていることを特徴とする分散給電システムを提供する。

【００１５】

第４には、風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、双方向ＤＣ－ＤＣコンバータおよび二巻線電子変圧器を経由してもしくは経由しないで交流専用負荷への分散給電を行う分散給電システムであって、風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、二巻線電子変圧器は交・直流両用で２つの双方向入出力端子を有し、且つ高周波変圧器とその蓄電池側および負荷側に設けられた変復調半導体スイッチとを有しており、当該二巻線電子変圧器の一方の双方向入出力端子は直流電力源の出力側に接続され、他方の双方向入出力端子は商用交流電源と交流専用負荷との間をＴ字型に接続しており、蓄電池が直流電力源により満充電に達するまでは商用交流電源からの交流電力を双方向ＤＣ－ＤＣコンバータおよび二巻線電子変圧器を経由しないで交流専用負荷へ供給し、蓄電池の満充電時もしくは商用交流電源の停電時には、直流電力源および蓄電池からの直流電力を双方向ＤＣ－ＤＣコンバータの半サイクル正弦波変調により単相全波整流波形に変換した後、二巻線電子変圧器の高周波変圧器の蓄電池側に設けられた変復調半導体スイッチを構成する２個または２対の単方向半導体スイッチの高周波変調位相を商用周波数の半サイクル毎に交互に逆転し、二巻線電子変圧器の高周波変圧器の負荷側に設けられた変復調半導体スイッチにより復調して正弦波交流出力を取り出して交流専用負荷へ供給し、蓄電池の放電進行時には燃料電池から電力補給を行い、夜間・深夜電力供給時間帯には商用交流電源からの交流電力を交流専用負荷へ供給するとともに、二巻線電子変圧器の有する双方向性および交・直流変換機能ならびに双方向ＤＣ－ＤＣコンバータの充電時の昇圧型高力率整流動作を併用して蓄電池の充電を行い、軽負荷時で蓄電池が満充電に近く且つ商用交流電源が停電でないときは直流電力を二巻線電子変圧器のエネルギー双方向伝送特性によって交流に変換し、商用交流電源側に自動的に位相同期して逆潮流させるようになっていることを特徴とする分散給電システムを提供する。

【００１６】

第５には、風力発電装置、太陽光発電装置および燃料電池のうちの少なくとも１つと、蓄電池と、商用交流電源とを用いて、双方向ＤＣ－ＤＣコンバータおよび三巻線電子変圧器を経由して交流専用負荷への分散給電を行う分散給電システムであって、風力発電装置、太陽光発電装置および燃料電池は各々の定格電力電圧が蓄電池の定格電圧に統一された直流電力源となっており、三巻線電子変圧器は交・直流両用で３つの双方向入出力端子を有し、且つ高周波変圧器とその商用交流電源側および蓄電池側および負荷側に設けられた変復調半導体スイッチを有し、直流電力源および蓄電池と商用交流電源と交流専用負荷とは当該三巻線電子変圧器によって相互に絶縁して接続されており、蓄電池が直流電力源により満充電に達するまでは商用交流電源からの交流電力を三巻線電子変圧器を経由して交流専用負荷へ供給し、蓄電池の満充電時もしくは商用交流電源の停電時には、直流電力源および蓄電池からの直流電力を双方向ＤＣ－ＤＣコンバータの半サイクル正弦波変調により単相全波整流波形に変換した後、三巻線電子変圧器の高周波変圧器の蓄電池側に設けら

れた変復調半導体スイッチを構成する２個または２対の単方向半導体スイッチの高周波変調位相を商用周波数の半サイクル毎に交互に逆転し、三巻線電子変圧器の高周波変圧器の負荷側に設けられた変復調半導体スイッチにより復調して正弦波交流出力を取り出して交流専用負荷へ供給し、蓄電池の放電進行時には燃料電池から電力補給を行い、夜間・深夜電力供給時間帯には商用交流電源からの交流電力を交流専用負荷へ供給するとともに、三巻線電子変圧器の有する双方向性および交・直流変換機能ならびに双方向ＤＣ－ＤＣコンバータの充電時の昇圧型高力率整流動作を併用して蓄電池の充電を行い、軽負荷時で蓄電池が満充電に近く且つ商用交流電源が停電でないときは直流電力を三巻線電子変圧器のエネルギー双方向伝送特性を用いて交流に変換し、商用交流電源側に自動的に位相同期して逆潮流させるようになっていることを特徴とする分散給電システムを提供する。

【００１７】

第６には、上記燃料電池用の圧縮水素の貯蔵が可能となっていることを特徴とする分散給電システムを提供する。

【発明の効果】

【００１８】

上記のとおりのこの出願の発明によれば、たとえば図３に例示したように、交流・直流源とも直接負荷に供給する場合、図１の従来例と比べてインバータの効率η_1が除かれる分、効率が改善されることになる。また、実際には保安上の理由から、商用交流電源と分散発電用機器との間に絶縁と変圧を兼ねた装置を挿入することが考えられ、この場合は改めてη_1'の効率を考慮する必要があるが、絶縁機能も含む数キロワット以下のＤＣ－ＡＣインバータの効率η_1は９０％前後であり、同一容量の電子変圧器の効率η_1'は９４～９５％であり、$\eta_1 < \eta_1$'となるので、この出願の発明によるシステムが優れている。

【発明を実施するための最良の形態】

【００１９】

［第一の実施形態］

図４は、この出願の発明の一実施形態を示したものである。

【００２０】

この図４に示した実施形態では、まず、風力発電装置ＷＴＧ(Wind Turbine Generator)、太陽光発電装置ＰＶ(Photo Voltaic)および燃料電池ＦＣ(Fuel Cell)の３つを組み合わせて用いており、それぞれ定格電力電圧が蓄電池Ｂ(Battery)の定格電圧に統一された直流電力源となっている。そして、蓄電池Ｂがそれら直流電力源ＷＴＧ，ＰＶ，ＦＣにより満充電に達するまでは商用交流電源Utilityからの交流電力を交・直流両用負荷Ｌac/dcへ供給し、蓄電池Ｂが満充電に達すると当該蓄電池Ｂからの直流電力を交・直流両用負荷Ｌac/dcへ供給し、蓄電池Ｂの放電が進んで放電終期に近づくと商用交流電源Utilityからの交流電力を交・直流両用負荷Ｌac/dcへ供給するように構成されており、制御回路（図示していない）によってその直流給電・交流給電の切り替えが制御されるようになっている。

【００２１】

蓄電池Ｂの充電は、通常は風力発電装置ＷＴＧおよび太陽光発電装置ＰＶにより行われ、それらの発生電力が十分でない場合は日中であれば燃料電池ＦＣにより行われ、夜間・深夜つまり日中より電気料金が安くなる時間帯であれば充電器ＣＨＧ１を介して夜間・深夜電力により行われる。

【００２２】

蓄電池Ｂが満充電に達すると、制御回路からの指示によりスイッチＳＷが開き、交流リレーＲＬが復旧して直流電源に切り換わり、交・直流両用負荷Ｌac/dcに引き続き直流電力を供給する。

【００２３】

蓄電池Ｂの放電終期に近づくと制御回路の指示によりスイッチＳＷが閉じ、商用交流電源Utilityによる交流給電に戻る。

【００２４】

［第二の実施形態］

図５は、この出願の発明の別の一実施形態を示したものである。

【００２５】

この図５に示した実施形態では、双方向ＤＣ－ＤＣコンバータConvおよび二巻線電子変圧器２を具備しており、二巻線電子変圧器２は、蓄電池側電圧と負荷側電圧との整合と絶縁機能を持つ高周波変圧器ＨＦＴと、その蓄電池側巻線および負荷側巻線に接続された１０～５０ｋＨｚで動作する変復調半導体スイッチＳＷ３，ＳＷ２と、さらに負荷側に接続されたフィルタＦ２とで構成されている。

【００２６】

この二巻線電子変圧器２は交・直流両用で２つの双方向入出力端子２ａ，２ｂを有し、一方の双方向入出力端子２ａは直流電力源の出力側に接続され、他方の双方向入出力端子２ｂは商用交流電源Utilityと交・直流両用負荷Ｌac/dcとの間をＴ字型に接続している。

【００２７】

かかる回路構成において、蓄電池Ｂが直流電力源ＷＴＧ，ＰＶ，ＦＣにより満充電に達するまでは商用交流電源Utilityからの交流電力を二巻線電子変圧器２を経由しないで交・直流両用負荷Ｌac/dcへ供給し、蓄電池Ｂの満充電時もしくは商用交流電源Utilityの停電時には直流電力源ＷＴＧ，ＰＶ，ＦＣおよび蓄電池Ｂからの直流電力を二巻線電子変圧器２を経由して交・直流両用負荷Ｌac/dcへ供給し、蓄電池Ｂの放電進行時には燃料電池ＦＣから電力補給を行い、夜間・深夜電力供給時間帯には商用交流電源Utilityからの交流電力を交・直流両用負荷Ｌac/dcへ供給するとともに、二巻線電子変圧器２の有する双方向性と交・直流変換機能とにより蓄電池Ｂの充電を行う。

【００２８】

そして、充・放電に伴う蓄電池電圧の変動は充電時・放電時を問わず双方向ＤＣ－ＤＣコンバータConvの電圧調整機能により蓄電池Ｂの電圧変動を調整し、交・直流両用負荷Ｌac/dcに安定した電圧を供給できるようになっている。

【００２９】

また、二巻線電子変圧器２は双方向性と交・直流変換機能とによる正・逆双方向のエネルギー伝送が可能であるため、双方向ＤＣ－ＤＣコンバータConvと連動して夜間・深夜電力の充電器（図１におけるＣＨＧ）の役割を果たすことができる。

【００３０】

［第三の実施形態］

図６は、この出願の発明のさらに別の一実施形態を示したものである。

【００３１】

この図６に示した実施形態では、商用交流電源Utilityと交・直流両用負荷Ｌac/dcとの間の絶縁と電源電圧の変動を調整するために、交・直流両用で３つの双方向入出力端子３ａ，３ｂ，３ｃを有する三巻線電子変圧器３を具備しており、直流電力源ＷＴＧ，ＰＶ，ＦＣおよび蓄電池Ｂと商用交流電源Utilityと交・直流両用負荷Ｌac/dcとを相互に絶縁して接続した構成となっている。三巻線電子変圧器３は、蓄電池側電圧と負荷側電圧との整合と絶縁機能を持つ高周波変圧器ＨＦＴと、その商用交流電源側巻線および蓄電池側巻線および負荷側巻線に接続された１０～５０ｋＨｚで動作する変復調半導体スイッチＳＷ１，ＳＷ３，ＳＷ２と、さらに商用交流電源側及び負荷側に接続されたフィルタＦ１，Ｆ２とで構成されている。

【００３２】

かかる回路構成において、蓄電池Ｂが直流電力源ＷＴＧ，ＰＶ，ＦＣにより満充電に達するまでは商用交流電源Utilityからの交流電力を三巻線電子変圧器３を経由して交・直流両用負荷Ｌac/dcへ供給し、蓄電池Ｂの満充電時もしくは商用交流電源Utilityの停電時には直流電力源ＷＴＧ，ＰＶ，ＦＣおよび蓄電池Ｂからの直流電力を三巻線電子変圧器３を経由して交・直流両用負荷Ｌac/dcへ供給し、蓄電池Ｂの放電進行時には燃料電池ＦＣから電力補給を行い、夜間・深夜電力供給時間帯には商用交流電源Utilityからの交流電力を交・直流両用負荷Ｌac/dcへ供給するとともに、三巻線電子変圧器３の有する双方向

性と交・直流変換機能とにより蓄電池の充電Ｂを行うようになっている。

【００３３】

ここで、商用交流電源Utilityの電圧変動に対しては変復調半導体スイッチＳＷ１，ＳＷ２のパルス幅変調（ＰＷＭ）制御またはパルス位相変調（ＰＰＭ）制御により電圧調整が可能であり、商用交流電源Utilityおよび直流電力源ＷＴＧ，ＰＶ，ＦＣの変動に対して安定した負荷電圧を供給でき、また同時に変復調半導体スイッチＳＷ１，ＳＷ３を通して夜間・深夜電力による充電も可能である。

【００３４】

以上の図５および図６の実施形態では、交流リレーＲＬの接点ＣＴ１，ＣＴ２，ＣＴ３により交流電力または直流電力を切り替えて交・直流両用負荷Ｌac/dcに電力を供給する回路構成となっており、風力発電装置ＷＴＧ、太陽光発電装置ＰＶおよび燃料電池ＦＣのエネルギーを、蓄電池Ｂを経由して商用交流電源側に逆潮流（系統連繋）させることなく、負荷側で消費する。

【００３５】

［第四の実施形態］

図７および図８は、各々、この出願の発明のさらに別の一実施形態を示したものである。これら図７および図８に示した実施形態では、蓄電池Ｂと双方向ＤＣ－ＤＣコンバータConvを直結することにより逆潮流が可能なものとなっている。現在、国内の売電契約の中では夜間・深夜電力を逆潮流させることは許容されていないが、風力発電・太陽光発電については逆潮流が認められており、燃料電池発電時の逆潮流については不明であるが、純技術的観点から見ると逆潮流はすべて可能になる。

【００３６】

本実施形態においては、まず、蓄電池Ｂが直流電力源ＷＴＧ，ＰＶ，ＦＣにより満充電に達するまでは、商用交流電源Utilityからの交流電力を、図７では双方向ＤＣ－ＤＣコンバーターConvおよび二巻線電子変圧器４を経由しないで、図８では三巻線電子変圧器５を経由して、交流専用負荷Ｌacへ供給する。蓄電池Ｂの満充電時もしくは商用交流電源Utilityの停電時には、直流電力源ＷＴＧ，ＰＶ，ＦＣおよび蓄電池Ｂからの直流電力を双方向ＤＣ－ＤＣコンバータConvの半サイクル正弦波変調により単相全波整流波形に変換した後、二巻線電子変圧器４（図７）・三巻線電子変圧器５（図８）の高周波変圧器ＨＦＴの蓄電池側に接続された変復調半導体スイッチＳＷ３を構成する２個または２対（計４個）の単方向半導体スイッチ（図示していない）の高周波変調位相を商用周波数の半サイクル毎に交互に逆転し、高周波変圧器ＨＦＴの負荷側に接続された変復調半導体スイッチＳＷ２により復調して正弦波交流出力を取り出して交流専用負荷Ｌacへ供給する。蓄電池Ｂの放電進行時には、燃料電池ＦＣから電力補給を行う。夜間・深夜電力供給時間帯には、商用交流電源Utilityからの交流電力を交流専用負荷Ｌacへ供給するとともに、二巻線電子変圧器４（図７）・三巻線電子変圧器５（図８）の有する双方向性および交・直流変換機能ならびに双方向ＤＣ－ＤＣコンバータConvの充電時の昇圧型高力率整流動作を併用して蓄電池Ｂの充電を行う。さらに、軽負荷時で蓄電池Ｂが満充電に近く且つ商用交流電源Utilityが停電でないときは、直流電力を二巻線電子変圧器４（図７）・三巻線電子変圧器５（図８）の有するエネルギーの双方向伝送特性を用いて交流に変換し、商用交流電源側に自動的に位相同期して逆潮流させる。

【００３７】

ここで、図７の実施形態における双方向ＤＣ－ＤＣコンバータConvの駆動方式について、図９および図１０を用いてより具体的に説明する。図９は夜間・深夜電力等の充電時、図１０は蓄電池Ｂから交・直流両用負荷Ｌac/dcまたは商用交流電源Utilityへ逆潮流させる場合のインバータ動作例を示している。

【００３８】

両図では、双方向ＤＣ－ＤＣコンバータConv（図７参照）を構成するスイッチＳ７，Ｓ８とダイオードＤ７，Ｄ８は、後述の図１１～図１４における回路素子記号との統一を採っている。その他の記号は図４～図８と同一である。二巻線電子変圧器４内の蓄電池側の

変復調半導体スイッチＳＷ３（図７参照）は、実際には後述の図１３に例示したように２個の単方向半導体スイッチＳ５，Ｓ６、あるいはブリッジの場合で２対（計４個）の単方向半導体スイッチ（図示していない）により構成できる。また負荷側の変復調半導体スイッチＳＷ２（図７参照）は、図１３に例示したように２個のスイッチＳ３，Ｓ４で構成できる。

【００３９】

蓄電池側の変復調半導体スイッチＳＷ３が２個の単方向半導体スイッチＳ５，Ｓ６により構成される場合において、単方向半導体スイッチＳ５，Ｓ６（図１３参照）を商用周波数の半サイクル毎に変調波の駆動位相を切り替えることにより、負荷側および商用交流電源側のスイッチＳ３，Ｓ４（図１３参照）が正弦波交流であるときは、双方向ＤＣ－ＤＣコンバータConvのコンデンサＣ６の両端に２相半波の直流出力電圧６が発生する（図９，図１３参照）。そして図９中のスイッチＳ８を通常の昇圧型力率改善専用ＩＣ（PFC-IC）で駆動し、一方でスイッチＳ７を止め、ダイオードＤ７を通してチョーク・コイルＣＨに蓄えられたエネルギーで蓄電池Ｂを充電する。蓄電池Ｂの充電電圧は昇圧動作のため、二巻線電子変圧器４の出力最大振幅より高い電圧が発生し、十分な充電が可能である。

【００４０】

一方、蓄電池Ｂから正弦波交流を発生させるインバータ動作の場合には、図１０に示したように、スイッチＳ７を正弦波変調されたＰＷＭ信号により駆動し、チョーク・コイルＣＨとコンデンサＣ６で構成されたフィルタ出力側に２相半波または単相全波整流出力６を発生させる。この出力を変復調半導体スイッチＳＷ３の単方向半導体スイッチＳ５，Ｓ６（図７，図１３参照）により高周波変調（１０ｋ～５０ｋＨｚ）するが、このとき変復調半導体スイッチＳＷ２のスイッチＳ３，Ｓ４（図７，図１３参照）側で正弦波となるように、単方向半導体スイッチＳ５，Ｓ６（図７，図１３参照）側で商用周波数の半サイクル毎に変調パルスの駆動位相を反転させる。このようにして、二巻線電子変圧器４の出力側つまり負荷側および商用交流電源側に正弦波交流出力を取り出すことができる。

【００４１】

また、全く同様の手法で、図８の三巻線電子変圧器５を用いて商用交流電源Utility、交流専用負荷Ｌacおよび蓄電池Ｂ系を完全に絶縁し、それぞれの電圧値にも整合する巻数比において、高周波変圧器ＨＦＴはすべて正弦波商用交流周波数でのエンベロープ変調動作が可能となり、負荷はすべて従来の交流専用負荷Ｌacが使用可能となる。

【００４２】

なお、以上の実施形態は風力発電装置ＷＴＧ、太陽光発電装置ＰＶおよび燃料電池ＦＣの３つ全てを組み合わせた場合のものであるが、それらのうちの１つのみを用いた場合でも任意の２つを組み合わせた場合でも、この出願の発明を適用できることは言うまでもなく、同様に優れた分散給電システムを実現できる。

【実施例１】

【００４３】

図１１は、図５の実施形態のより具体的な一実施例を示したものである。使われている符号は図５中の符号と一致しているので、ここでは追加した符号のみ説明する。

【００４４】

まず、ＴＭは交・直流給電および夜間・深夜電力充電のためのタイマーで、制御回路CONT-2により制御される。CONT-1は風車発電装置ＷＴＧの制御回路で、風車発電装置ＷＴＧが交流の場合は自動車用発電機のように整流し、直流の場合はそのまま電圧調整を行う通常公知の制御回路となる。Ｓ３，Ｓ４は双方向半導体スイッチで、図中の拡大図のとおり２個の単方向半導体スイッチを背面突合せ(Back to Back Connection)として交・直流両用のスイッチ動作を行う。Ｓ５～Ｓ８は単方向半導体スイッチで、Ｄ５～Ｄ８は内蔵または外付のダイオード、Ｃ１～Ｃ６はコンデンサ、ＣＨはチョーク・コイルである。Ｎ２～Ｎ４は高周波変圧器ＨＦＴの巻線である。

【００４５】

この図１１の実施例において、商用交流電源Utilityからの交流給電時には単方向半導

体スイッチＳ５，Ｓ６，Ｓ７を止め、双方向半導体スイッチＳ３，Ｓ４と高周波変圧器ＨＦＴとダイオードＤ５，Ｄ６を通してコンデンサＣ６の両端に直流電圧が発生する。この直流電圧を単方向半導体スイッチＳ８およびダイオードＤ７により電圧調整して蓄電池Ｂの充電が可能になり、それと同時に交・直流両用負荷Ｌac/dcに交流電力を供給する。日中の太陽光発電や時間帯を問わない風力発電を主として商用交流電源Utilityからの充電は従来または零としても差し支えない。商用交流電源Utilityの停電時には交流リレーＲＬの復旧により直ちに直流電力源ＷＴＧ，ＰＶ，ＦＣおよび蓄電池Ｂからの直流給電に切替わり、二巻線電子変圧器２を通して負荷側に直流電力が給電され、交・直流両用負荷Lac/dcが動作を持続する。このときは、単方向半導体スイッチＳ８のみが動作を止め、単方向半導体スイッチＳ７およびダイオードＤ８で直流電圧を制御つまり降圧調整する。また蓄電池Ｂの放電に伴い燃料電池ＦＣを動作させ、放電を行うこともできる。

【００４６】

以上の説明は商用交流電源Utilityの停電時間の長い場合であるが、停電が無い場合でも蓄電池Ｂが満充電に到達した場合には、制御回路CONT-2の指令によりタイマーＴＭによりスイッチＳＷをオフとし、直流給電に切り替えることにより自然エネルギーおよび燃料電池による分散給電を実現できる。

【実施例２】

【００４７】

図１２は、図６の実施形態のより具体的な一実施例を示したものである。この図１２の実施例では、電子変圧器を三巻線として各電源と負荷とを絶縁し、さらに商用交流電源Utilityの変動をＰＷＭまたはＰＰＭ制御により安定化することは前述したとおりである。この場合の三巻線電子変圧器３の動作の概要は以下のとおりである。

【００４８】

図１５（ａ）（ｂ）（ｃ）は、各々、三巻線電子変圧器３の動作概要を説明するための波形図である。図１５（ａ）において左側の波形は、入力商用交流電圧がフィルタＦ１を通った後、すなわち三巻線変圧器３の交流入力側端子電圧を示す。この入力波形がＣ１，Ｃ２，Ｓ１，Ｓ２からなるハーフ・ブリッジ回路によって図１５（ａ）の中央部に示したように高周波リング変調され、高周波変圧器ＨＦＴの一次巻線Ｎ１に加えられる。今、二次巻線Ｎ２の巻数が一次巻線Ｎ１の巻数と同じ場合にはＳ３，Ｓ４，Ｃ３，Ｃ４によって構成されるハーフ・ブリッジ（この場合は倍電圧回路として動作）によって二次巻線Ｎ２に発生する電圧の２倍の電圧が復調される。この場合のスイッチの駆動タイミングは、Ｓ１とＳ３，Ｓ２とＳ４が同一タイミングで駆動されているものとする。すなわち、高周波変復調技術によって、復調側には原信号である正弦波交流波形がそのまま再現され、高周波変調によって変圧器のみが小型、軽量化され、商用変圧器に比べて効率も向上する。このとき、巻線Ｎ３，Ｎ４に発生する高周波交流をダイオードＤ５，Ｄ６によって整流し、双方向ＤＣ－ＤＣコンバータConvによって蓄電池Ｂの充電を併行して行なえることは言うまでもない。

【００４９】

次に、商用交流電源Utilityの停電時または蓄電池Ｂの満充電時には高周波変圧器ＨＦＴの巻線Ｎ３，Ｎ４と半導体スイッチＳ５，Ｓ６によってプッシュ・プルのインバータ回路により高周波の矩形波信号が発生するが、このときＳ３，Ｓ４によって巻線Ｎ２に発生した矩形波電圧は倍電圧回路によって２倍の電圧値をもつ直流となり、交・直流両用負荷Ｌac/dcに直流電力を供給する。すなわち、高周波変復調によって動作する電子変圧器は交、直流を問わず電圧を変換することが可能なのである。

【００５０】

図１５（ｂ）は、直流入力が巻線Ｎ３，Ｎ４に加わる場合の高周波変圧器ＨＦＴの電圧を中央部に例示したものである。図１５（ｃ）は、二次巻線側のＳ３，Ｓ４スイッチに公知のＰＷＭ制御を行って負荷側の電圧を調整する場合の一例を示したものである。交流変復調の場合を例示したが、直流入力の場合も全く同様に制御可能であることは言うまでもない。

【００５１】

なお、負荷の一部として燃料電池ＦＣ用の圧縮燃料Fuel（主として水素）を軽負荷時に圧縮機ＣＯＭＰにより作成し貯蔵しておくことにより、自家発電用および電動車両用等に使えば、蓄電池容量の低減化と負荷変動の平準化やクリーン・エンジン化時代に備えた環境改善にも役立つ。

【実施例３】

【００５２】

図１３および図１４は、各々、図７および図８の実施形態のより具体的な一実施例を示したものであり、図１１，図１２における交・直流両用負荷Ｌac/dcの制約をなくして交流専用の既存設備との整合性を重視し、同時に、直流源から電子変圧器を通して商用交流電源Utility側に逆潮流をも可能にしたものであり、図１３は蓄電池Ｂ側のみの二巻線電子変圧器４を介して商用交流電源Utilityおよび交流専用負荷Ｌacに接続した場合のものであり、図１４は三巻線電子変圧器５を介して直流電力源ＷＴＧ，ＰＶ，ＦＣおよび蓄電池Ｂと商用交流電源Utilityと交流専用負荷Ｌacとを相互に絶縁して接続した場合のものである。

【００５３】

図１１，図１２と比較した大きな相違点は、単方向半導体スイッチＳ５，Ｓ６が充・放電時いずれも動作している点にある。また、図９，図１０に示したように双方向ＤＣ－ＤＣコンバータConvにおいて、蓄電池電圧と２相半波または単相全波整流出力６を正・逆双方向に変換し、単方向半導体スイッチＳ５，Ｓ６において交流変調または復調変換を行って、二巻線電子変圧器４・三巻線電子変圧器５内では、常に交流変調成分のみで動作させている。このことによって、交流専用負荷側には交流給電・直流給電を問わず、常に交流出力を取り出すことができる。

【００５４】

この動作を実現するために、たとえば図１６（ａ）（ｂ）に例示したように三巻線電子変圧器５のスイッチＳ１～Ｓ６の駆動パルス位相を商用交流電源Utilityの正の半サイクルと負の半サイクルの期間、交互に逆転することにより、v_1とv_2は常に交流正弦波形で動作し、直流回路のv_3端子には常に単相全波または２層半波の直流入出力が発生しながら、三巻線電子変圧器５の磁束の変化は常に前述の図１５（ａ）に例示した交流変調動作を行わせることができる。

【００５５】

図１３の二巻線変圧器４の場合には、図１６の例でＮ１がない場合に相当し、他の動作は全く同じであることは言うまでもない。

【００５６】

いずれにしても二巻線電子変圧器４、三巻線電子変圧器５の２組または３組の入出力端子間で電力エネルギーの双方向伝送が直流から数１００ヘルツの交流まで可能である点が商用電源電圧器と大きく異なる点であり、このことが本願発明のシステム構成の基本特徴となっている。

【００５７】

さらに、もう一つの特徴は、商用交流電源Utilityの停電がない限り、蓄電池側から二巻線電子変圧器４・三巻線電子変圧器５を通して商用交流電源側へ逆潮流を行うことが可能になる。なお、この場合、停電時のインバータ動作用発振器を内蔵することは言うまでもない。

【００５８】

もちろん、この出願の発明は以上の実施形態および実施例に限定されるものではなく、細部については様々な態様が可能である。

【産業上の利用可能性】

【００５９】

以上詳しく説明したとおり、この出願の発明によって、変動要因の大きい自然エネルギー系電力と深夜電力や燃料電池等の安定電力とを組み合わせて、ほぼ１００％に近い使用

率で共通に利用される電子変圧器を介して負荷に安定電力を供給し、システム全体の価格・性能比率を高め、分散給電の普及促進と省エネルギー化を図ることのできる、新しい分散給電システムが提供される。

【図面の簡単な説明】

【００６０】

【図１】低圧配電系において交・直流エネルギー源を分散給電システムに使用する場合における従来の家電機器の交・直流給電の適合性の可否を分類した図である。

【図２】低圧配電系において交・直流エネルギー源を直接負荷に供給する場合における太陽光発電と風力発電の従来例を示した図である。

【図３】この出願の発明に従って給電系と交・直流両用負荷とを接続した場合の一例を説明するための図である。

【図４】この出願の発明の一実施形態を示した図である。

【図５】この出願の発明の別の一実施形態を示した図である。

【図６】この出願の発明のさらに別の一実施形態を示した図である。

【図７】この出願の発明のさらに別の一実施形態を示した図である。

【図８】この出願の発明のさらに別の一実施形態を示した図である。

【図９】図７の実施形態における双方向ＤＣ－ＤＣコンバータの動作を説明するための図である。

【図１０】図７の実施形態における双方向ＤＣ－ＤＣコンバータの動作を説明するための図である。

【図１１】この出願の発明の一実施例を示した図である。

【図１２】この出願の発明の別の一実施例を示した図である。

【図１３】この出願の発明のさらに別の一実施例を示した図である。

【図１４】この出願の発明のさらに別の一実施例を示した図である。

【図１５】三巻線電子変圧器の動作概要を説明するための図である。

【図１６】三巻線電子変圧器の直流変換動作原理を説明するための図である。

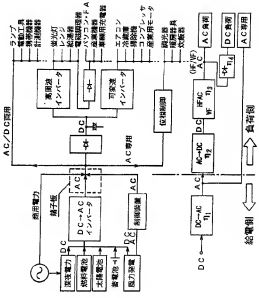
【符号の説明】

【００６１】

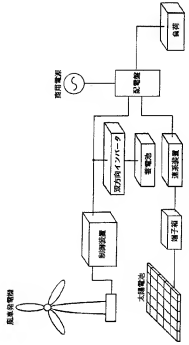
Ｌac/dc　交・直流両用負荷
Ｌac　交流専用負荷
Utility　商用交流電源
ＷＴＧ　風車発電装置
ＰＶ　太陽光発電装置
ＦＣ　燃料電池
Ｂ　蓄電池
Conv　双方向ＤＣ－ＤＣコンバータ
　Ｓ７，Ｓ８　単方向半導体スイッチ
　Ｄ７，Ｄ８　ダイオード
　Ｃ５，Ｃ６　コンデンサ
　ＣＨ　チョーク・コイル
１　充電器ＣＨＧ
２　二巻線電子変圧器
　２ａ，２ｂ　双方向入出力端子
　ＨＦＴ　高周波変圧器
　Ｎ２～Ｎ４　巻線
　Ｆ２　フィルタ
　ＳＷ２，ＳＷ３　変復調半導体スイッチ
　Ｓ３，Ｓ４　双方向半導体スイッチ
　Ｓ５，Ｓ６　単方向半導体スイッチ
　Ｄ５，Ｄ６　ダイオード

Ｃ３，Ｃ４　コンデンサ
3　三巻線電子変圧器
３ａ，３ｂ，３ｃ　双方向入出力端子
ＨＦＴ　高周波変圧器
Ｎ１～Ｎ４　巻線
Ｆ１，Ｆ２　フィルタ
ＳＷ１～ＳＷ３　変復調半導体スイッチ
Ｓ１～Ｓ４　双方向半導体スイッチ
Ｓ５，Ｓ６　単方向半導体スイッチ
Ｄ５，Ｄ６　ダイオード
Ｃ１～Ｃ４　コンデンサ
4　二巻線電子変圧器
４ａ，４ｂ　双方向入出力端子
ＨＦＴ　高周波変圧器
Ｎ２～Ｎ４　巻線
Ｆ２　フィルタ
ＳＷ２，ＳＷ３　変復調半導体スイッチ
Ｓ３，Ｓ４　双方向半導体スイッチ
Ｓ５，Ｓ６　単方向半導体スイッチ
Ｄ５，Ｄ６　ダイオード
Ｃ３，Ｃ４　コンデンサ
5　三巻線電子変圧器
５ａ，５ｂ，５ｃ　双方向入出力端子
ＨＦＴ　高周波変圧器
Ｎ１～Ｎ４　巻線
Ｆ１，Ｆ２　フィルタ
ＳＷ１～ＳＷ３　変復調半導体スイッチ
Ｓ１～Ｓ４　双方向半導体スイッチ
Ｓ５，Ｓ６　単方向半導体スイッチ
Ｄ５，Ｄ６　ダイオード
Ｃ１～Ｃ４　コンデンサ
6　単相全波または２相半波の直流出力電圧
Ｄ１～Ｄ４　ダイオード
ＳＷ　スイッチ
ＲＬ　交流リレー
ＣＴ１，ＣＴ２，ＣＴ３　交流リレー接点
ＴＭ　タイマー
ＣＯＮＴ－１　風力発電制御装置
ＣＯＮＴ－２　分散給電制御装置
Ｔ　端子板
ＣＯＭＰ　圧縮機
Ｆｕｅｌ　燃料電池用燃料
ＡＣ　交流
ＤＣ　直流
I_c　充電電流
Ｉ INV　インバータ電流
ＩＢ　蓄電池電流
ＥＢ　蓄電池電圧

【図１】



【図２】



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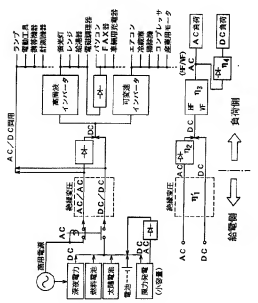

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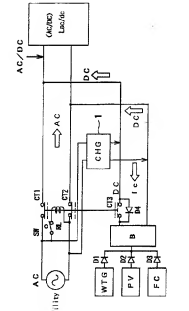

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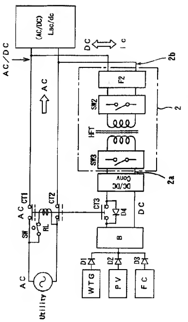
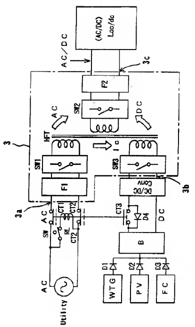


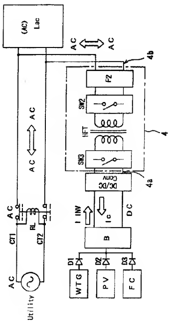
(AC/DC)
Lac/dc
AC/DC
DC
Ic
2b
F2
SW2
2
HFT
SW3
DC/DC
Conv
2a
CT1
CT2
CT3
D4
AC
SW
RL
DC
B
D1
D2
D3
WTG
PV
FC
Utility

【図６】



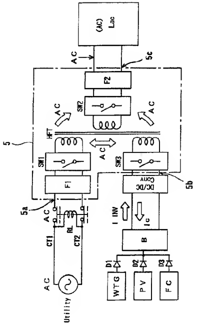
(AC/DC)
Lac/dc
AC/DC
3c
F2
SW2
AC
DC
HFT
Ic
3
SW1
F1
SW3
DC/DC
Conv
3b
3a
AC
CT1
CT2
CT3
D4
DC
SW
RL
B
D1
D2
D3
WTG
PV
FC
Utility

【図７】



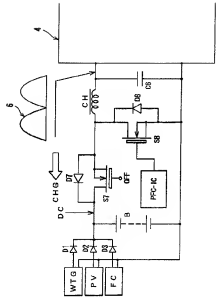
(AC)
Lac
AC
4b
F2
SW2
HFT
4
SW3
DC/DC
Conv
4a
I INV
Ic
DC
CT1
RL
CT2
B
D1
D2
D3
WTG
PV
FC
Utility

【図８】



(AC)
Lac
AC
5c
F2
SW2
HFT
5
SW1
F1
SW3
DC/DC
Conv
5b
5a
I INV
Ic
CT1
RL
CT2
B
D1
D2
D3
WTG
PV
FC
Utility

【図９】



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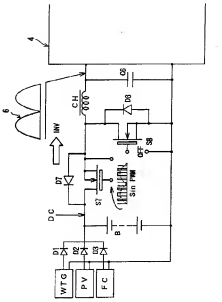

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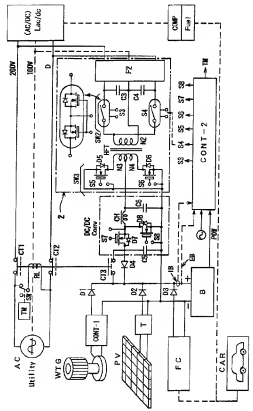

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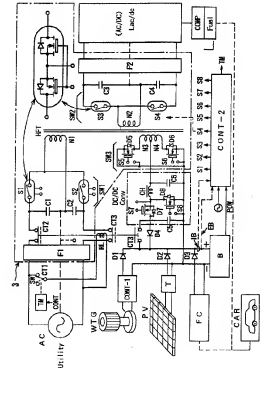

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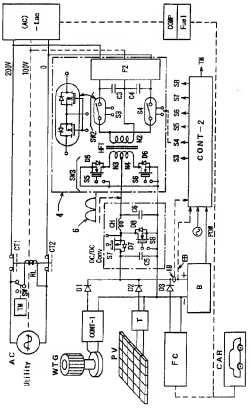

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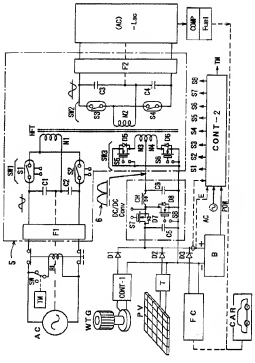

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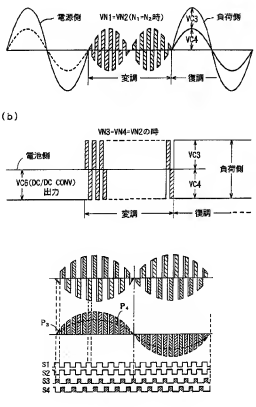

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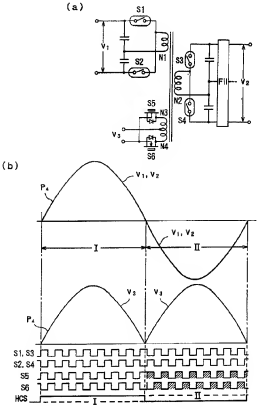

フロントページの続き

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	Ｈ０１Ｌ 31/04	Ｑ	

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5H027 AA02 BA14 DD03 MM26 MM27

【要約の続き】
c/dcへ供給するようになっている。
【選択図】 図４